Self-tracking Modes: Reflexive Self-Monitoring and Data Practices

Deborah Lupton, News & Media Research Centre, Faculty of Arts & Design, University of Canberra

Paper for the 'Imminent Citizenships: Personhood and Identity Politics in the Informatic Age' workshop, 27 August 2014, ANU, Canberra

Abstract

The concept of 'self-tracking' (also referred to as life-logging, the quantified self, personal analytics and personal informatics) has recently begun to emerge in discussions of ways in which people can voluntarily monitor and record specific features of their lives, often using digital technologies. There is evidence that the personal data that are derived from individuals engaging in such reflexive self-monitoring are now beginning to be used by actors, agencies and organisations beyond the personal and privatised realm. Self-tracking rationales and sites are proliferating as part of a 'function creep' of the technology and ethos of self-tracking. The detail offered by these data on individuals and the growing commodification and commercial value of digital data have led government, managerial and commercial enterprises to explore ways of appropriating self-tracking for their own purposes. In some contexts people are encouraged, 'nudged', obliged or coerced into using digital devices to produce personal data which are then used by others. This paper examines these issues, outlining five modes of self-tracking that have emerged: private, communal, pushed, imposed and exploited. The analysis draws upon theoretical perspectives on concepts of selfhood, citizenship, biopolitics and data practices and assemblages in discussing the wider sociocultural implications of the emergence and development of these modes of self-tracking.

Biographical Note

Deborah Lupton is Centenary Research Professor in the News & Media Research Centre, Faculty of Arts & Design, University of Canberra. Her latest books are *Medicine as Culture,* 3rd edition (Sage, 2012), *Fat* (Routledge, 2013), *Risk*, 2nd edition (Routledge, 2013), *The Social Worlds of the Unborn* (Palgrave Macmillan, 2013), *The Unborn Human* (editor, Open Humanities Press, 2013) and *Digital Sociology* (Routledge, 2015). Deborah's current research interests are in the critical sociology of big data, self-tracking cultures, the digitisation of children, academic work in the digital era and critical digital health studies.

Introduction

The concept of 'self-tracking' (also referred to as life-logging, the quantified self, personal analytics and personal informatics) has recently begun to emerge in discussions of ways in which people can monitor and record specific features of their lives. Some self-trackers collect data on only one or two dimensions of their lives and for a short time. Others may do so for hundreds of phenomena and for long periods. Some self-trackers simply collect information about themselves as a way of remembering and recording aspects of their lives. Others take an approach which is more specifically goal-oriented, seeking to discern patterns and reflect on and make meaning out of the information they choose to collect. Once the data are collected, self-tracking practices typically incorporate organisation, analysis, interpretation and representation of the data (such as producing statistics or graphs and other data visualisations) to make sense of them, and efforts to determine how these data can offer insights for the user's life.

Monitoring features of one's life and reflecting upon them in the quest for self-knowledge are not new practices. Traditional self-tracking practices have included ages-old strategies such as journaling and diary-keeping. In the contemporary era many people engage in self-tracking using a range of methods. A Pew Research Center (Fox & Duggan, 2013) survey of Americans' self-tracking practices found that a high proportion – almost 70 per cent – did so, either for themselves or a loved one, with weight, diet or exercise routines the most frequently monitored. The majority of these people did not use digital technologies for monitoring: rather they kept track simply in their heads or using pen-and-paper. However the recent focus on self-tracking in both popular forums and the academic literature centres on using digital technologies for monitoring aspects of one's life. Mobile digital devices connected to the internet, devices and environments that are fitted with digital sensors and the possibilities for data archiving and sharing that are afforded by computing cloud technologies have contributed to the ever more detailed measurement and monitoring of people's activities, bodies and behaviours in real time and the analysis, presentation and sharing of these data.

It is on the new digitised strategies for self-tracking that I focus here, particularly as these technologies are raising a number of new issues concerning the use of personal data, surveillance and citizenship. Self-tracking at first glance appears to be a highly specialised subculture, confined to the chronically ill, obsessives, narcissists or computer geeks. Many portrayals of self-tracking represent it as a voluntary and private practice, undertaken for purely personal reasons. This form of participatory self-surveillance is often represented as distinct from and in opposition to covert forms of surveillance or those that are imposed upon people. So too the 'personal' or 'small data' that are consciously collected in self-tracking are frequently positioned as different from the anonymous 'big data' sets that are generated as part of people's routine interactions with digital platforms, social media and the sensor-embedded spaces in which they move. However the concept and practices of self-tracking are now dispersing rapidly into multiple social domains. There is evidence of 'function creep', or

the move of self-tracking practices from private and participatory self-surveillance to collective and imposed surveillance.

A body of literature is beginning to emerge that examines the social, cultural and political dimensions of the phenomenon of self-tracking (Lupton, 2012a, 2013a, 2013b, 2014a; Nafus, 2014; Nafus & Sherman, 2014; Pantzar & Ruckenstein, 2014; Ruckenstein, 2014; Whitson, 2013). As yet, however, there has been no sustained examination of the spreading out of self-tracking cultures and practices from the purely personal into multiple social domains. This paper examines these issues, focusing on five modes of self-tracking.

Technologies of self-tracking

Digitised self-tracking has attracted a high level of attention from developers and entrepreneurs seeking to capitalise on the practice. The technologies themselves are viewed as a major source of potential revenue for digital developers and entrepreneurs, who are taking a keen interest in how best to produce technologies to market to self-trackers, and often attend Quantified Self meetups and conferences (Boesel, 2013b; Nafus & Sherman, 2014). It has been estimated that the shipment of wearable technologies will exceed 485 million annually by 2018, and that in 2013 61 per cent of the wearable technologies market was occupied by sporting and physical activity personal tracking devices (ABIResearch, 2013). Tens of thousands of self-tracking apps are available for downloading to smartphones and iPod devices. Smartphones themselves include sensors such as GPS, gyroscopes and accelerometers that can be employed for self-tracking and iPod Nanos come already equipped with fitness tracking apps such as Nike+ and a pedometer.

Perhaps the most public face of self-tracking is the Quantified Self website. The 'quantified self' term was invented in 2007 by two *Wired* magazine editors, Gary Wolf and Kevin Kelly. They went on to establish the official website (*Quantified Self*, 2014) and its associated Quantified Self Labs, a collaboration of users and tool makers who are interested in working together to share expertise and experiences of self-tracking. The Quantified Self website provides discussion forums, supports regional meetings of members and two annual international conferences and publishes a blog in which various aspects of self-tracking and developing 'self knowledge though numbers' (the group's motto) are explained and the strategies and findings of members about their own self-tracking efforts are publicised.

The Quantified Self website (*Quantified Self guide to self-tracking tools*, 2014) lists over 500 self-tracking tools, including in addition to geolocation, health, fitness, weight, sleep, diet and mood or feeling tracking apps, services and devices that are able to record social interactions, emails, networks and social media status updates and comments. Other listed tools also allow users to track their meditation practices, television watching, computer use and driving habits, financial expenses, time use, beneficial habits and work productivity, and to monitor local environmental conditions,

progress towards learning or the achievement of personal goals (see also the Personal Informatics website for another long list of tools (*Personal informatics tools*, 2014)).

A number of 'smart' objects have been developed that provide capacities for self-monitoring. Cars can now monitor driving habits and drowsiness, alerting drivers if they are at risk of falling asleep at the wheel. Mattresses can monitor sleep patterns and body temperature, chairs can sense physical movements and 'smart' shoes and clothing can record activity and other physical data. The concept of 'self'-tracking may be extended well beyond the envelope of the individual body. People can use sensor-based technologies to monitor not only their own habits, bodies and behaviours but those of intimate others (such as their children) and companion animals as well as environmental conditions such as air temperature, humidity, light conditions, gases, air quality and pollution and their home's use of energy. Some of these smart objects can now exchange data with each other, so that, for example, users' smart home thermostat system can now read the sleep data from their wearable device to ensure that the heating is switched on as soon as people begin to wake in the morning (Olson & Tilley, 2014).

The digital data that are continually generated by individuals have become invested with symbolic and commercial value and status (Andrejevic, 2013; Andrejevic & Burdon, in press; Kitchin, 2014a, 2014b; Lupton, 2015). The collection and analysis of personal data via self-tracking practices are now becoming increasingly advocated and implemented in many social contexts and institutions, including the workplace, education, medicine and public health, insurance, marketing and commerce, the military, citizen science and urban planning and management. The growing commodification and commercial value of digital data sets and their use in these domains are blurring the boundaries between small and big data, the private and the public. The personal data that people collect about themselves are now often represented as offering contributions to the aggregation of big data sets. People are now encouraged, 'nudged', obliged or coerced into using digital devices for monitoring aspects of their lives to produce personal data which can then be used for the purposes of others.

Modes of self-tracking

I have developed a typology of the five distinctive modes of self-tracking that have emerged in recent times. These are private, pushed, communal, imposed and exploited self-tracking. There are intersections and recursive relationships between each of these self-tracking positions. However there are also observable differences related to the extent to which the self-tracking is taken up voluntarily and the purposes to which the data thus created are put.

Private self-tracking

A major feature and attraction of self-tracking for many practitioners is using the information they collect on themselves to achieve self-awareness and optimise or

improve their lives. The data and the knowledge contained therein are represented as enabling self-tracking practitioners to achieve better health, higher quality sleep, greater control over mood swings, improved management of chronic conditions, less stress, increased work productivity, better relationships with others and so on. In many cases this is all self-initiated and voluntary, as part of the quest for self-knowledge and self-optimisation and as an often pleasurable and playful mode of selfhood.

Private self-tracking, as espoused in the Quantified Self's goal of 'self knowledge through numbers', is undertaken for purely personal reasons and the data are kept private or shared only with limited and selected others. Portrayals of self-tracking in the popular media often focus on this mode, with regular references to the 'narcissism' or 'self-experimentation' that self-tracking supposedly involves (Lupton, 2013a). The private self-tracking mode is often articulated in accounts that seek to define the self-tracking phenomenon. According to the Quantified Self Institute, a research body that is part of the Hanze University of Applied Sciences in the Netherlands and associated with the Quantified Self founders, self-tracking 'is a functionally "selfish" activity, which is a result of a personal motivation. "Me and my data", that is the point of the Quantified Self' (de Groot, 2014, no page number given). Similarly the online Oxford Dictionaries definition defines self-tracking as: 'The practice of systematically recording information about one's diet, health, or activities, typically by means of a smartphone, so as to discover behavioural patterns that may be adjusted to help improve one's physical or mental well-being' ("Self-tracking," 2014).

Research investigating the motives of self-trackers has found that they are often involved for private and personal reasons. One study of American self-trackers (Li, Dey, & Forlizzi, 2010) found that the reasons the participants gave for engaging in self-monitoring were related to curiosity about what their data would reveal, an interest in quantitative data and numbers in general as part of being a 'geek', an interest in experimenting with new tools for self-tracking, acting on a suggestion from another person, and trigger events, such as suffering from sleep problems, wanting to lose weight or developing an illness. Another study analysed 52 videos of meet-up talks posted on the Quantified Self website (Choe, Lee, Lee, Pratt, & Kientz, 2014). The researchers found that members of the largest group of self-trackers were monitoring health-related factors such as physical activity, food consumption, weight and mood. Another group was interested in tracking their work productivity and cognitive performance. A third group was identified, comprised of people who wanted to have new life experiences through self-tracking as part of experimenting. Indeed the term 'self-experimentation' was used frequently across the speakers as relating to finding meaning knowledge about themselves that they could use for self-optimisation.

There is a strong emphasis on personal experience in the Quantified Self community. People who discuss their self-tracking practices in Quantified Self forums are encouraged to talk about 'What I did, how I did it and what I learned'. In this and other self-tracking circles the concept of 'n=1' is often articulated, conveying the idea that collecting data is a personal enterprise that is limited to the individual. Not only do self-trackers make choices about what data about themselves are important to collect,

they make sense of and use data in highly specific and acculturated ways. They seek to make connections between diverse sets of data: how diet, meditation or caffeine affect their concentration, for example, or how their mood is influenced by exercise, sleep patterns or geographical location, or the specific interactions of all of these variables. Indeed the very idiosyncrasy or uniqueness of many self-trackers' interests and consequent self-tracking data practices means that their data may not be interesting or valuable to others as it is not easily transferrable (Nafus & Sherman, 2014).

Pushed self-tracking

Pushed self-tracking departs from the private self-tracking mode in that the initial incentive for engaging in self-tracking comes from another actor or agency. Self-monitoring may be taken up voluntarily, but in response to external encouragement or advocating rather than as a wholly self-generated and private initiative.

In a growing number of forums self-tracking is advocated as a means for achieving behavioural change in target groups to achieve better health or other outcomes. This approach is referred to in computing science research as 'persuasive computing', or using digital technologies to 'nudge' people into behaviour change (Purpura, Schwanda, Williams, Stubler, & Sengers, 2011; Rooksby, Rost, Morrison, & Chalmers, 2014). Advocates for pushed self-tracking are particularly evident in the patient self-care, health promotion and preventive medicine literature. Arguments for persuading people to self-track such bodily features as their body weight and physical activity level, and in the case of patients with chronic illnesses, such aspects as blood glucose level and blood pressure are becoming increasingly common in this literature (see, for example, MacLeod, Tang, & Carpendale, 2013; Rabin & Bock, 2011; Swan, 2009, 2012). In this context the personal data that are generated from self-tracking are represented as pedagogical and motivational, a means of encouraging self-reflection or emotional responses such as fear, guilt or shame that will lead to the advocated behaviour changes (Lupton, 2012b, 2013b), or else as a form of self-care that allows people with chronic conditions to reduce their interactions with healthcare providers and become 'digitally engaged' (Lupton, 2013c).

The workplace has become a key site of pushed self-tracking, where financial incentives or the importance of contributing to 'team spirit' and productivity may be offered for participating. Many employers are turning to the use of digital self-tracking technologies ('digital wellness tools') as part of workplace health promotion programs or 'wellness programs', particularly in the US, where employers pay for health insurance coverage of their employees and it is therefore in their financial interests to promote good health among their workers. Wearable technology manufacturers such as Fitbit are brokering deals with employers and insurance companies to sell their fitness and activity trackers and data analytics software as part of these wellness programs (Olson & Tilley, 2014). Mobile apps and software programs that remind employees to get up from their desks and take exercise breaks and to help them manage stress and sleep better are becoming more often used in the workplace (Zamosky, 2014).

Insurance companies are beginning to develop other ways of incorporating self-tracking data into the calculation of risks and resultant premiums that are offered to customers. Motor vehicle insurers led the way with their telematic devices attached to car engines to monitor driving practices as part of 'usage-based' insurance that calculates customised premiums using these data as well as demographic information (NAIC, 2014). Health and life insurance companies in the US and elsewhere are also directly offering consumers the opportunity to use self-tracking devices for health and fitness. For example Wellness & Prevention, a health insurance subsidiary of the Johnson & Johnson company, has developed a proprietary app, Track Your Health, that is offered solely to their customers. Track Your Health incorporates data from several third party apps and uploads these data to the company's platform. Customers can also enter their data manually into the platform or use data collected by their smartphone on their physical activity. They can then view their data to monitor their progress towards health- or fitness-related goals (Comstock, 2014).

Communal self-tracking

While self-tracking, in its very name and focus on the 'self' may appear to be an individualistic practice, many self-trackers view themselves as part of a community of trackers (Boesel, 2013a; Lupton, 2013a; Nafus & Sherman, 2014; Rooksby, et al., 2014). They use social media, platforms designed for comparing and sharing personal data and sites such as the Quantified Self website to engage with and learn from other self-trackers. Some attend meet-ups or conferences to engage face-to-face with other self-trackers and share their data and evaluations of the value of different techniques and devices for self-tracking. Indeed one of the founders of the Quantified Self, Gary Wolf, has contended from the beginning that self-tracking need not be a purely solipsistic enterprise: 'The excitement in the self-tracking movement right now comes not just from the lure of learning things from one's own numbers but also from the promise of contributing to a new type of knowledge, using this tool we all build' (Wolf, 2009, p. no page number given).

This drive towards 'sharing your numbers' fits into the wider discourse of content creation and sharing personal details and experiences with others that underpins many activities on Web 2.0 social media platforms (Beer, 2013; John, 2013). However the focus on personal motivation and individual benefit is often still apparent in these discussions of the communal nature of self-tracking. While there is constant reference among members of the Quantified Self movement to the 'Quantified Self community', this community largely refers to sharing personal data with each other, or learning from others' data or self-tracking or data visualisation methods so that one's own data practices may be improved. Several commentators have begun to refer to 'the quantified us' as a way of articulating how the small data produced by self-trackers may be usefully incorporated into large data sets to 'get more meaning out of our data' (Ramirez, 2013, p. no page number given). As this suggests, the concept of quantified us still focuses firmly on the individual's agenda. The idea is to draw on others' pooled data to further one's own interests and goals: 'Quantified Self can provide added value, when

you start sharing your data online and other self-trackers share their data as well. All this combined data provide an enormous amount of extra information for you' (de Groot, 2014, p. no page number given).

Another portrayal of communal self-tracking is that which is frequently championed in discourses on citizen science, environmental activism, healthy cities and community development. These initiatives, sometimes referred to as 'citizen sensing' (Gabrys, 2014), are a form of crowdsourcing. They involve the use of data that individuals collect on their local environs, such as air quality, traffic levels or crime rates. The concepts of the 'healthy city' and the 'smart city' are beginning to come together in some attempts to use the digitised sensing and monitoring technologies for health promoting purposes (Kamel Boulos & Al-Shorbaji, 2014; Kamel Boulos et al., 2011). One example is the initiative announced by New York University in 2014, involving its collaboration with the developers of a new residential area in that city, Hudson Yards, to create a 'quantified community' in the interests of efficiency and residents' health and wellbeing. Information on such factors as pedestrian traffic, air quality, energy production and consumption and health and physical activity levels of residents was to be routinely collected as part of this project (Anuta, 2014).

These data may be used in various ways. Sometimes they are simply part of gathering collective data at the behest of local agencies but they are also sometimes used in political efforts to challenge governmental policy and agitate for improved services or planning. The impetus may come from grassroots organisations or encouraged upon citizens as top-down initiatives from governmental organisations as part of community development.

Imposed self-tracking

What I call 'imposed self-tracking' is the foisting of the use of self-tracking devices upon individuals by others primarily for these others' benefit. One example is the productivity self-tracking devices that are becoming a feature of many workplaces as employers seek to identify the habits of staff members in the interests of collecting data that will assist in maximising worker efficiency or reduce costs. Some companies, including those in the banking, technology, pharmaceutical and healthcare industries, require their employees to wear badges equipped with RFID chips and other sensors that can record sound, geo-location and physical movement to monitor such aspects of the wearers as tone of voice, posture and who they speak to and for how long (Lohr, 2014).

Another example of imposed self-tracking is the use of digital self-tracking devices and apps in school-based health and physical education. Some physical education teachers are beginning to require their students to wear such devices as heart-rate monitors to determine whether they are fully participating in set exercise activities and to compare their exertions with other students (Lupton, submitted). In these contexts people often have little choice over whether they engage in self-tracking practices. School students must follow the directions of their teachers and wearing

tracking devices may be required as part of workers' productivity monitoring and linked to pay and promotion opportunities (Lohr, 2014).

At its most coercive, imposed self-tracking is used in programs involving monitoring of location and drug use for probation and parole surveillance, drug addiction programs and family law and child custody monitoring. Digital cellular monitoring devices allow radio frequency monitoring of offenders who are serving at-home sentences. In some criminal justice systems global positioning technologies are also used to track parolees' movements. Several self-tracking devices to monitor alcohol use have been developed for use in programs for alcohol addiction and policing. The secure continuous remote alcohol monitoring device is used to provide alcohol testing (via the wearer's sweat) through the wearing of a bracelet or anklet. Some such monitoring devices combine a number of biometric tracking and surveillance technologies. For example the Soberlink company has developed digital mobile alcohol breath-testing devices that combine alcohol-monitoring with facial recognition technologies for authenticating identity. They send text messages to clients to remind them to test their breath and send the data to designated contacts. These devices are marketed to criminal justice, family law and addiction treatment agencies.

Exploited self-tracking

I use the term 'exploited self-tracking' to refer to the ways in which individuals' personal data (whether collected purely for their own purposes or as part of pushed, communal or imposed self-tracking) are repurposed for the (often commercial) benefit of others. The notion of personal data as commodities is now frequently articulated in commercial circles. Opportunities to use these data are viewed as valuable in informing companies about consumer habits and preferences. For example market research companies use self-tracking apps issued to their research subjects to gauge their habits and responses to brands. Research subjects are issued with an app that has often been developed specifically for this purpose which is able to send them messages throughout the day asking them to answer such questions as 'How do you feel right now?', 'What did you have for lunch today' or 'How did you sleep last night?' and which use smartphone sensors to collect such features as the geo-location of users. The Datarella company, for example, has developed an app called Explore, described as 'your personal coach', which is formatted to ask questions of the user throughout the day as a means of generating individual data for the user's personal use. The company also sells the data to businesses as a way of generating information about customers and clients.

Self-tracking is often marketed to consumers as a way for them to benefit personally, whether by sharing their information with others as a form of communal self-tracking or by earning points or rewards. Customer loyalty programs, in which consumers voluntarily sign up to have their individual purchasing habits logged by retailers in return for points or rewards is one example. Their data are used by the retailers to gather data about their customers, learn more about purchasing habits generally and to target the individual with promotions, special offers and advertising.

The personal data that are uploaded by participants in these activities, therefore, are used by third parties for commercial gain.

Some retailers are beginning to use wearable devices as part of their customer rewards schemes. One example is the 'Balance Rewards for Healthy Choices' program offered by Walgreens, America's largest pharmacy retailing chain. As part of a customer loyalty program people are offered the opportunity to 'earn points for your healthy choices' to save money on products and 'take advantage of great, exclusive offers for members'. They can do so by recording details of their physical activity, chronic disease management or progress towards a health-related goal such as losing weight or ceasing smoking and syncing the data collected by digital fitness trackers or uploading data to the Walgreens' platform or customised app (Walgreens, 2014).

The intersections of self-tracking modes

There are intersections and blurring between the various modes of self-tracking that I have identified here. The private mode of self-tracking can merge with communal self-tracking when the focus is encouraging people to achieving community development or other collective goals via self-tracking data. This representation of self-tracking portrays it as a civic duty in producing small data that is valuable not only or simply for personal use but also for the purposes of others in one's community. Reflexive self-monitoring is still a feature of this mode when it involves sharing data with other self-trackers, as in Quantified Self forums, but some versions of communal self-tracking incorporate notions of participatory democracy, citizenship and community. Indeed the concept of what I call 'self-tracking citizenship' involves a distribution of subjectivity that incorporates technologies and the data they gather as part of its ethos and practice (Gabrys, 2014).

The overlapping of self-tracking modes is apparent in platforms such as PatientsLikeMe and similar websites that have been established to promote the sharing of experiences between patients who have the same medical condition. The overt objective of these platforms is to provide a place where patients can talk to each other, exchange information and provide support, and some offer self-tracking tools for users to monitor their symptoms and therapies as well. Here the reflexive monitoring subject is the patient who digitally tracks their symptoms, illness experiences and therapies (private self-tracking), but also shares these data with other patients for mutual benefit (communal self-tracking). The data generated on these websites are also used by the developers and by third-parties such as medical researchers and pharmaceutical companies who are given access to the data, sometimes on payment of a fee. In some cases these third-party uses of the data may be viewed as benefiting the patient community; when new therapies are tested, for example. But in other cases only the developers and third-parties benefit by harvesting the patients' data for commercial gain (Lupton, 2014c). This is a form of exploited self-tracking.

There is a fine line between pushed self-tracking and imposed self-tracking. While some elements of self-interest may still operate and a discourse of 'choice' may be

employed, people may have little option of opting out. In the case of workplace wellness programs involving self-tracking of physical activity or body weight, for instance, employees may be given the option of wearing the devices and allowing employers to view their personal data. However failure to participate may lead to higher health insurance premiums enforced by an employer, as is happening in some workplaces in the US (Olson, 2014; Olson & Tilley, 2014). In these contexts the use of self-tracking devices becomes imposed upon the user where they otherwise might not have chosen to engage in self-tracking or to share their personal data with others.

Discussion

Self-tracking cultures have emerged in a sociocultural context in which various rationales, discourses, practices and technologies are converging. These include the following: concepts of the self that value self-knowledge, self-awareness and self-entrepreneurialism; a moral and political environment in which taking responsibility for one's life as an individual rational actor is privileged and promoted; the ability of digital technologies to monitor an increasing array of aspects of human bodies, behaviours, habits and environments; the emergence of the digital data knowledge economy, in which both small data and big data are valued for their insights and have become tradeable commodities; and the realisation on the part of government, managerial and commercial actors and agencies that the data derived from self-tracking can be mobilised for their own purposes.

Self-tracking may be theorised as a practice of selfhood that conforms to cultural expectations concerning the importance of self-awareness, reflection and taking responsibility for managing, governing oneself and improving one's life chances. A Foucauldian perspective as articulated in the work of theorists on contemporary selfhood (Elliott, 2013; Rose, 1990, 2007a) can readily be adopted to theorise the modes and ethics of selfhood that are demonstrated in self-tracking cultures. What might be described as 'the reflexive monitoring self' (Lupton, 2014b) in the context of digitised tracking technologies is an aggregation of practices that combine regular and systemised information collection, interpretation and reflection as part of working towards the goal of becoming. Underpinning these efforts are the notion of an ethical incompleteness and a set of moral obligations concerning working on the self that are central to contemporary ideas about selfhood and citizenship (Foucault, 1988). The idealised reflexive monitoring subject as represented in popular forums and some of the academic literature focusing on the benefits of self-tracking is highly rational, motivated and data-centric. Underpinning this ideal is the belief that the self-knowledge that will eventuate will allow self-trackers to exert greater control over their destinies.

The self-tracking phenomenon offers an exemplar of the ways in which digital technologies participate in the configuration of selfhood, embodiment and social relations and locate the individual within digitised networks and economies. Bodies are increasingly digitised in a multitude of ways (Lupton, 2015; O'Riordan, 2011), including digital self-tracking devices recording personal information. A feedback loop is

established, in which personal data are produced from digital technologies which then are used by the individual to assess her or his activities and behaviour and modify them accordingly (Lupton, 2012b). Discourses on self-tracking therefore also reveal notions of the value of data and the importance of creating data that are about oneself. Self-tracking is portrayed as a means by which the hidden patterns in one's life that are otherwise undiscernible may be not only identified, but most importantly, acted upon (Lupton, 2014b).

Unlike the 'passive' forms of personal data collection that are characteristic of many other forms of transactional user engagement with online technologies, self-tracking is an 'active' and purposeful data practice. Self-tracking may thus be further conceptualised as a data practice that produces data assemblages. A data assemblage is a complex sociotechnical system composed of many actors whose central concern is the production of data (Kitchin, 2014b, p. 24). In the case of self-tracking, these data assemblages are configured via systems of thought, forms of knowledge, business or government models, human users, practices, devices and software, and also sometimes by networks of other users and agents other than the self-tracker who seek to make use of the data for their own purposes. Given the ways in which digital data are generated, stored, managed and used, once they are digitised, the array of practices that began as personal and private tend to become inextricably imbricated within these networks and economies.

The use and ownership of personal data by actors and agencies other than the individual who generates these data are beginning to have major implications for social discrimination and justice issues. The algorithms constructed by software coders bring digital data together in certain ways that result in 'algorithmic identities' that are configured on the behalf of users (Cheney-Lippold, 2011). These algorithmic identities can have material effects. Like the use of biometric technologies for the authentication of identity (Ajana, 2013; Lyon, 2002, 2008; Pugliese, 2010) or employing big digital data sets to predict individuals' behaviours and exclude certain individuals and groups from access to goods and services or identify them as security risks (Andrejevic, 2013, 2014; Crawford & Schultz, 2014), self-tracking data can be mobilised as surveillant technologies in ways that further entrench the social disadvantage of marginalised groups. This use of personal data may again take place without people having any control or even knowledge of how the data are analysed and employed. An 'algorithmic authority' is exerted, in which the decisions made by software coders play a dominant role in shaping individuals' life chances (Cheney-Lippold, 2011). People are gradually realising how the data that are collected on them when they use the internet or customer loyalty programs are becoming used for commercial purposes (Andrejevic, 2014; The Wellcome Trust, 2013). Post-Snowden and the mass media coverage of the documents he released, they have been apprised of the ways in which digital data are used by national security agencies for the mass surveillance of their own citizens, including not only those data derived from mobile phone and social media but also the personal data that are generated by the use of apps (Ball, 2014).

Like many other forms of digital data, self-tracking data have a vitality and social life of their own, circulating across and between a multitude of sites (Beer, 2013; Lash, 2006; Lyon & Bauman, 2013). Few self-trackers who use digital technologies, other than the most technically adept who are able to craft their own digital self-tracking tools and silo their data, are able to avoid this circulation and re-use of their personal data. Shifting forms of selfhood are configured via these digital data assemblages, depending on the context in and purpose for which they are assembled. As the digital data produced by self-tracking are constantly generated and the combinations of data sets that may be brought together on individuals are numerous, personal data assemblages are never stable or contained. They represent a 'snap-shot' of a particular moment in time and a particular rationale of data practice. The data assemblages are always mutable, dynamic, responsive to new inputs and interpretations (Lupton, 2015). They thus represent a type of selfhood that is distributed between different and constantly changing data sets. To gain meaning from these data sets, self-trackers or third parties who seek to use their data must engage in sense-making that can interpret these data and gain some purchase on their mutating forms.

Self-tracking cultures and practices, in their focus identifying and making sense of the characteristics of individual lives, may be viewed as an element in contemporary biopolitical governance and economies. The movement of self-tracking cultures into commercial, managerial and government domains combines the rationalities of biocapital with those of the digital data economy. The personal data that are generated from self-tracking may be conceptualised as a form of 'lively capital'. This term has previously been employed to describe the increasing incorporation of the life sciences into market regimes (Sunder Rajan, 2012). I would argue, however, that just as other forms of human life have become commodified and invested with monetary value, so too have the digital data assemblages that are configured on human bodies via self-tracking. Indeed the value that is attributed to personal digital data assemblages combine two forms of value: that related to the digital data economy and that emerging from the capitalisation of the human body. Biocapital involves the derivation of value from biological entities such as human bodies (Rose, 2007a, 2007b) while the digital data economy positions digital data objects as valuable. Many self-tracking practices involve the rendering of bodily attributes and dispositions into digital data. They produce value in terms of the intimate bio-digital knowledges that they generate on individuals, and therefore self-tracking practices may be described as generating digital biocapital. These data are forms of 'lively capital' both because they are generated from life itself and because as digital data they are so labile, recursive and fluid.

Beyond the biopolitical dimension of self-tracking, it can also be theorised as a new kind of politics; namely data politics. Some self-trackers engage with practices of data collection in critical and resistant ways, seeking to exert greater control over the ways in which their personal data are collected, archived and used. They are attempting to generate and control their own algorithmic identities, in other words. These practices are in response to a growing awareness of the ways in which personal data are structured, archived and appropriated by commercial, government or surveillance

agencies. This issue of 'controlling my data' frequently comes up for discussion on the Quantified Self website and in their meetups and conferences. The project of reflexive self-monitoring for many self-trackers involves reflection not only on the uses to which personal data can be put by oneself but on the validity of the data, whether the kinds of data they collect are appropriate for their purposes, how best to display or visualise their data and how best to share their data with others and convey the insights they garner from the data. Beyond these reflexive data practices, some self-trackers confront the next level of data use: where their personal data are algorithmically generated and stored, how they are harvested by other actors, what these actors do with their data and how one can gain access to one's personal data.

Nafus and Sherman (2014) contend that self-tracking is an alternative data practice that is a form of soft resistance to algorithmic authority and the harvesting of individuals' personal data. They argue that self-tracking is nothing less than 'a profoundly different way of knowing what data is, why it is important, who gets to interpret it, and to what ends' (2014, p. 1785). However I would contend that this kind of soft resistance is evident only in practices of private and communal self-tracking. The other modes I have here outlined allow less space for soft resistance. It is difficult for self-trackers to avoid the exploitation of their personal data by other actors or agencies. While a small minority of technically-proficient self-trackers are able to devise their own digital technologies for self-tracking, the vast majority must rely on the commercialised products that are available. In most cases the personal data that they generate using these technologies become the property of the developers.

Many people express powerlessness in the face of the authority of the internet empires to collect, own and harvest their personal data (Andrejevic, 2014). Sometimes self-trackers agree to the use of their personal data as an unavoidable part of accepting the terms and conditions of self-tracking devices, apps and platforms (although to what extent users actually read through the fine-print on these documents is not known) or customer loyalty schemes. In other cases their data may be accessed for the purposes of others without their knowledge or consent. The developers of many health and fitness apps, for example, do not provide privacy policies or fail to inform users that their data are available to third parties (Ackerman, 2013; Sarasohn-Kahn, 2014). The security of personal data that have been uploaded to digital platforms is not always failsafe, as several reports have demonstrated, and may be accessed by unknown third parties for their own purposes (Ackerman, 2013; Barcena, 2014). The vitality of digital data and the many different ways in which digital data may be repurposed by different actors and agencies cannot be predicted, and therefore, are not amenable to control.

As humans increasingly become nodes in the Internet of Things, generating and exchanging digital data with other sensor-equipped objects, self-tracking practices will become unavoidable for many people, whether they are taken up voluntarily or pushed or imposed upon them. The evidence outlined in this paper suggests a gradually widening scope for the use of self-tracking that is likely to expand as a growing number of agencies and organisations realise the potential of the data that are produced from these practices.

References

ABIResearch. (2013). Wearable computing devices, like Apple's iWatch, will exceed 485 million annual shipments by 2018. *ABIResearch*. Retrieved from https://www.abiresearch.com/press/wearable-computing-devices-like-apples-iwatch-will

Ackerman, L. (2013). Mobile Health and Fitness Applications and Information Privacy. San Diego, CA: Privacy Rights Clearing House.

Ajana, B. (2013). *Governing through Biometrics: the Biopolitics of Identity*. Basingstoke: Palgrave Macmillan.

Andrejevic, M. (2013). *Infoglut: How Too Much Information is Changing the Way We Think and Know*. New York: Routledge.

Andrejevic, M. (2014). The big data divide. *International Journal of Communication, 8*. Retrieved from http://ijoc.org/index.php/ijoc/article/view/2161

Andrejevic, M., & Burdon, M. (in press). Defining the sensor society. *Television & New Media*.

Anuta, J. (2014). Hudson's Yards to be first 'quantified community'. *Crain's New York*. Retrieved from http://www.crainsnewyork.com/article/20140414/REAL_ESTATE/140419932/hudson-yards-to-be-first-quantified-community#

Ball, J. (2014). Angry Birds and 'leaky' phone apps targeted by NSA and GCHQ for user data. Retrieved from http://www.theguardian.com/world/2014/jan/27/nsa-gchq-smartphone-app-angry-birds-personal-data

Barcena, M. B. (2014). How Safe is Your Quantified Self? Mountain View, CA: Symantech.

Beer, D. (2013). *Popular Culture and New Media: the Politics of Circulation*. Houndmills: Palgrave Macmillan.

Boesel, W. E. (2013a). What is the quantified self now? Retrieved from http://thesocietypages.org/cyborgology/2013/05/22/what-is-the-quantified-self-now/#more-15719

Boesel, W. E. (2013b). Return of the quantrepreneurs. *Cyborgology*. Retrieved from http://thesocietypages.org/cyborgology/2013/09/26/return-of-the-quantrepreneurs/

Cheney-Lippold, J. (2011). A new algorithmic identity: soft biopolitics and the modulation of control. *Theory, Culture & Society, 28*(6), 164-181.

Choe, E. K., Lee, N. B., Lee, B., Pratt, W., & Kientz, J. A. (2014). *Understanding quantified-selfers' practices in collecting and exploring personal data.* Paper presented at the Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems, Toronto.

Comstock, J. (2014). Johnson & Johnson subsidiary launches self-tracking app. *MobiHealthNews*. Retrieved from http://mobihealthnews.com/33348/johnson-johnson-subsidiary-launches-self-tracking-app/

Crawford, K., & Schultz, J. (2014). Big data and due process: toward a framework to redress predictive privacy harms. *Boston College Law Review, 55*(1), 93-128.

de Groot, M. (2014). Quantified Self, Quantified Us, Quantified Other. *Quantified Self Institute*. Retrieved from http://www.qsinstitute.org/?p=2048

Elliott, A. (2013). The theory of new individualism. In R. Tafarodi (Ed.), *Subjectivity in the Twenty-First Century: Psychological, Sociological, and Political Perspectives* (pp. 190-209). Cambridge: Cambridge University Press.

Foucault, M. (1988). Technologies of the self. In L. Martin, H. Gutman & P. Hutton (Eds.), *Technologies of the Self: A Seminar with Michel Foucault* (pp. 16-49). London: Tavistock.

Fox, S., & Duggan, M. (2013). Tracking for Health. Washington, DC: Pew Research Center.

Gabrys, J. (2014). Programming environments: environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space, 32*(1), 30-48.

John, N. (2013). Sharing and Web 2.0: the emergence of a keyword. *New Media & Society, 15*(2), 167-182.

Kamel Boulos, M., & Al-Shorbaji, N. (2014). On the Internet of Things, smart cities and the WHO Healthy Cities. *International Journal of Health Geographics, 13*(1), 10. Retrieved from http://www.ij-healthgeographics.com/content/13/1/10

Kamel Boulos, M., Resch, B., Crowley, D. N., Breslin, J. G., Sohn, G., Burtner, R., . . . Chuang, K.-Y. S. (2011). Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: trends, OGC standards and application examples. *International Journal of Health Geographics, 10*(1). Retrieved from http://www.ij-healthgeographics.com/content/10/1/67

Kitchin, R. (2014a). Big Data, new epistemologies and paradigm shifts. *Big Data & Society, 1*(1), ??

Kitchin, R. (2014b). *The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences*. London: Sage.

Lash, S. (2006). Life (Vitalism). *Theory, Culture & Society, 23*(2-3), 323-329.

Li, I., Dey, A., & Forlizzi, J. (2010). *A stage-based model of personal informatics systems.* Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Atlanta.

Lohr, S. (2014). Unblinking eyes track employees. *The New York Times*. Retrieved from http://www.nytimes.com/2014/06/22/technology/workplace-surveillance-sees-good-and-bad.html?module=Search&mabReward=relbias%3Ar&_r=1

Lupton, D. (2012a). The quantified self movement: some sociological perspectives. Retrieved from http://simplysociology.wordpress.com/2012/11/04/the-quantitative-self-movement-some-sociological-perspectives/

Lupton, D. (2012b). M-health and health promotion: the digital cyborg and surveillance society. *Social Theory & Health, 10*(3), 229-244.

Lupton, D. (2013a). Understanding the human machine. *IEEE Technology & Society Magazine, 32*(4), 25-30.

Lupton, D. (2013b). Quantifying the body: monitoring and measuring health in the age of mHealth technologies. *Critical Public Health, 23*(4), 393-403.

Lupton, D. (2013c). The digitally engaged patient: self-monitoring and self-care in the digital health era. *Social Theory & Health, 11*(3), 256-270.

Lupton, D. (2014a). Quantified sex: a critical analysis of sexual and reproductive self-tracking using apps. *Culture, Health & Sexuality, online first*.

Lupton, D. (2014b). Beyond the quantified self: the reflexive monitoring self. *This Sociological Life*. Retrieved from http://simplysociology.wordpress.com/2014/07/28/beyond-the-quantified-self-the-reflexive-monitoring-self/

Lupton, D. (2014c). The commodification of patient opinion: the digital patient experience economy in the age of big data. *Sociology of Health & Illness, 36*(6), 856-869.

Lupton, D. (2015). *Digital Sociology*. London: Routledge.

Lupton, D. (submitted). Response to Gard: data assemblages, the sentient school and digitised HPE. *Sport, Education and Society*.

Lyon, D. (2002). Everyday surveillance: Personal data and social classifications. *Information, Communication & Society, 5*(2), 242-257.

Lyon, D. (2008). Biometrics, identification and surveillance. *Bioethics, 22*(9), 499-508.

Lyon, D., & Bauman, Z. (2013). *Liquid Surveillance: A Conversation*. Oxford: Wiley.

MacLeod, H., Tang, A., & Carpendale, S. (2013). *Personal informatics in chronic illness management.* Paper presented at the Proceedings of the 2013 Graphics Interface Conference.

Nafus, D. (2014). Stuck data, dead data, and disloyal data: the stops and starts in making numbers into social practices. *Distinktion: Scandinavian Journal of Social Theory, 15*(2), 208-222.

Nafus, D., & Sherman, J. (2014). This one does not go up to 11: the Quantified Self movement as an alternative big data practice. *International Journal of Communication, 8*, 1785-1794.

NAIC. (2014). Usage-based insurance and telematics. *National Association of Insurance Commissioners and the Center for Insurance Policy and Research*. Retrieved from http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm

O'Riordan, K. (2011). Revisiting digital technologies: envisioning biodigital bodies. *Communications, 36*(3), 291-312.

Olson, P. (2014). Get ready for wearable tech to plug into health insurance. *Forbes*. Retrieved from http://www.forbes.com/sites/parmyolson/2014/06/19/wearable-tech-health-insurance/

Olson, P., & Tilley, A. (2014). The quantified other: Nest and Fitbit chase a lucrative side business. *Forbes*. Retrieved from http://www.forbes.com/sites/parmyolson/2014/04/17/the-quantified-other-nest-and-fitbit-chase-a-lucrative-side-business/

Pantzar, M., & Ruckenstein, M. (2014). The heart of everyday analytics: emotional, material and practical extensions in self-tracking market. *Consumption Markets & Culture, online first*.

. *Personal informatics tools*. (2014). Retrieved from http://www.personalinformatics.org/tools/

Pugliese, J. (2010). *Biometrics: Bodies, Technologies, Biopolitics*. London: Routledge.

Purpura, S., Schwanda, V., Williams, K., Stubler, W., & Sengers, P. (2011). *Fit4life: the design of a persuasive technology promoting healthy behavior and ideal weight.* Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.

. *Quantified Self*. (2014). Retrieved from http://quantifiedself.com/

. *Quantified Self guide to self-tracking tools*. (2014). Retrieved from http://quantifiedself.com/guide/tools?sort=reviews&pg=1

Rabin, C., & Bock, B. (2011). Desired features of smartphone applications promoting physical activity. *Telemedicine journal and e-health : the official journal of the American Telemedicine Association, 17*(10), 801-803.

Ramirez, E. (2013). How can we get more meaning out of our data? Retrieved from http://quantifiedself.com/2013/08/how-can-we-get-more-meaning-out-of-our-data/

Rooksby, J., Rost, M., Morrison, A., & Chalmers, M. C. (2014). *Personal tracking as lived informatics.* Paper presented at the Proceedings of the 32nd annual ACM conference on Human factors in computing systems, Toronto.

Rose, N. (1990). *Governing the Soul: The Shaping of the Private Self*. London: Routledge.

Rose, N. (2007a). *The Politics of Life Itself. Biomedicine, Power, and Subjectivity in the Twenty-First Century*. Princeton, NJ: Princeton University Press.

Rose, N. (2007b). Molecular biopolitics, somatic ethics and the spirit of biocapital. *Social Theory & Health, 5*(1), 3-29.

Ruckenstein, M. (2014). Visualized and Interacted Life: Personal Analytics and Engagements with Data Doubles. *Societies, 4*(1), 68-84.

Sarasohn-Kahn, J. (2014). Here's Looking at You: How Personal Health Information is Being Tracked and Used: California Healthcare Foundation.

Self-tracking. (2014). *Oxford Dictionaries*. Retrieved from http://www.oxforddictionaries.com/definition/english/self-tracking

Sunder Rajan, K. (2012). Introduction: the capitalization of life and the liveliness of capital. In K. Sunder Rajan (Ed.), *Lively Capital: Biotechnologies, Ethics, and Governance in Global Markets* (pp. 1-41). Durham, North Carolina: Duke University Press.

Swan, M. (2009). Emerging patient-driven health care models: an examination of health social networks, consumer personalized medicine and quantified self-tracking. *International Journal of Environmental Research and Public Health, 6*(2), 492-525.

Swan, M. (2012). Health 2050: the realization of personalized medicine through crowdsourcing, the quantified self, and the participatory biocitizen. *Journal of Personalized Medicine, 2*(3), 93-118.

The Wellcome Trust. (2013). *Summary Report of Qualitative Research into Public Attitudes to Personal Data and Linking Personal Data*. Retrieved from

http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/documents/web_document/wtp053205.pdf

Walgreens. (2014). Walgreens rewards healthy activities through first community pharmacy program to include behavior change training based on Dr BJ Fogg's methodology. *Walgreens*. Retrieved from http://news.walgreens.com/article_display.cfm?article_id=5883

Whitson, J. (2013). Gaming the quantified self. *Surveillance & Society, 11*(1/2), 163-176.

Wolf, G. (2009). Know thyself: tracking every facet of life, from sleep to mood to pain, 24/7/365. *Wired*. Retrieved from http://archive.wired.com/medtech/health/magazine/17-07/lbnp_knowthyself

Zamosky, L. (2014). Digital health tools are a growing part of workplace wellness programs. *iHealthBeat*. Retrieved from http://www.ihealthbeat.org/insight/2014/digital-health-tools-are-a-growing-part-of-workplace-wellness-programs